DOCUMENT RESUME

ED 286 731 SE 048 569

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TITLE Evaluation of the Hinsdale School District 181 Telewriter Program.
INSTITUTION Institute for Educational Research, Glen Ellyn, IL.
PUB DATE Apr 82
NOTE 32p.; Contains some light and broken type which may not reproduce well.
PUB TYPE Reports - Descriptive (141) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Achievement; *Audiovisual Aids; Classroom Communication; Distance Education; Educational Technology; Elementary Education; *Elementary School Mathematics; Mathematical Concepts; Mathematics Education; *Mathematics Instruction; Mathematics Skills; *Student Attitudes; *Telecommunications
IDENTIFIERS *Telewriting

ABSTRACT

Telewriting is the program using Victor Electrowriter equipment to broadcast lessons to the elementary schools in the Hinsdale (Illinois) district. This study was organized for two purposes. First, the study was intended to complement and extend the evaluation activities which have been carried out periodically, and second, it was designed to address some key questions posed by district administrators. The issue central to these questions was whether telewriting should be made available to qualified fifth grade students in all elementary school buildings in the district. Three kinds of data including: (1) objective (or test score) data; (2) student self-reports on two attitude questionnaires; and (3) observational data reported by IER (Institute for Educational Research) research staff, were collected for current sixth grade students (some of whom participated in the telewriter program in fifth grade on a trial basis). Results indicated that previous participation in the fifth grade Telewriter program did tend to perform better on certain kinds of tests than students who were in the program only during sixth grade, but that factor did not seem to contribute significantly, either positively or negatively, to the attitude or motivation of sixth grade Telewriter students. (TW)

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EVALUATION OF THE HINSDALE SCHOOL DISTRICT 181 TELEWRITER PROGRAM

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April, 1982

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INTRODUCTION

The Telewriter program in District 181 has, for the past several years, offered a quite special form of mathematics instruction to able sixth grade students. Until recently, Telewriter was available only to sixth graders. In the 1980-81 school year, the program was expanded to include fifth graders in three of the seven District 181 elementary schools. Selection of students for both fifth and sixth grade Telewriter classes is based upon standardized test scores (California Achievement Test), scores on a district-developed test, classroom performance, and teacher recommendation. Both the fifth and sixth grade Telewriter curricula focus on concepts at the upper end of grade level or above grade level. Successful students have completed district-wide seventh grade mathematics objectives by the end of sixth grade.

The expansion of Telewriter to include fifth grade represents a significant commitment of district resources. During the 1981-82 school year, District 181 requested IER to design and conduct an evaluation of the Telewriter program. The evaluation design was developed following consultations with the Telewriter staff (teacher and aides) and with Dr. Ronald Simcox, District 181 Superintendent. Two primary information needs were identified in these conferences:

1. The administration requires information to contribute to an informed decision regarding expansion or reduction of the fifth grade Telewriter program.

2. The teaching staff needs information useful for program improvement, including relatively successful and less successful program elements.

The purpose of this report is to present findings and data germane to both information needs. The project was authorized by Dr. Simcox. Mrs. Kathy Effinger, teacher of the Telewriter program, coordinated the District 181 evaluation activities, including compilation of all test score data. Dr. Nan Simpson coordinated IER activities.

The report is organized as follows:

Purpose of the Study
Sources of Data
Program Description
Design
Analysis and Results
Summary and Recommendations

PURPOSE OF THE STUDY

There are two major purposes of the Telewriter evaluation study. First, the study complements and extends the evaluation activities which have been carried out periodically by the District 181 staff. Second, the study addresses key questions posed by District 181 administrators. The issue central to these questions is whether Telewriter should be made available to qualified fifth grade students in all elementary buildings in the district. As stated earlier, the program has been offered to fifth graders on a trial basis in three elementary schools since fall of 1980. Before committing the additional resources necessary for offering fifth grade Telewriter in the other four elementary schools, the administration seeks empirical evidence to support such a decision.

SOURCES OF DATA

Data were collected only for current sixth grade Telewriter students. Three kinds of data were gathered for this study, objective (or test score) data, student self reports on two attitude questionnaires, and observational data recorded by the IER research staff.

Mrs. Effinger collected and recorded on special forms all test scores used in the study. These included standardized test scores, and scores from end-of-chapter and teacher-constructed tests administered in class. In all, twenty-three test scores were compiled. A complete listing of all test scores is given in the Appendix.

During February, 1982, all sixth graders were asked to complete two questionnaires. One was a district-developed form intended to determine student attitudes towards the program. A similar questionnaire has been employed in previous evaluations conducted by district staff. The other questionnaire, designed to measure motivation, was developed at the University of Illinois, (Ururoglu et al, 1981) and published in Psychology in the Schools.

The observation data was collected by IER researcher, Nan Simpson, during a day-long site visit to the Telewriter program. Four classes and the broadcasting station were observed. Observations included fifth and sixth grade classes, at three of the seven elementary schools in the district.

PROGRAM DESCRIPTION

Telewriter is a method of delivering mathematics instruction to fifth and sixth grade students in Hinsdale District 181. The program makes use of Victor Electrowriter equipment to broadcast lessons to all seven elementary schools in the district. Telewriter makes it possible for accelerated mathematics students in all of the districts' elementary schools to receive instruction from a gifted and experienced teacher.

Telewriter from the Student Perspective

The Telewriter room at each elementary school is a designated classroom or learning center. The central piece of equipment is the Electrowriter machine, connected by phone line hookup to the master unit at the originating school. The classroom Electrowriter looks somewhat like an overhead projector with an attached recording felt tip pen. The pen records on a continuous acrylic sheet, and the image is projected onto a large screen at the front of the room.

A microphone, suspended from the ceiling, enables students to speak to the teacher, and a speaker on the wall transmits the teacher's responses to the class.

Telewriter from the Teacher's Perspective

The broadcasting center is an office in Elm School. The transmitting Electrowriter machine has a writing surface approximately 5" by 7", on which the teacher writes with a special stylus. The marks are converted to signals transmitted via phone lines to the receiving station in each school. The teacher can advance the paper to clear the text window. This causes the continuous acrylic sheet at each receiving station to advance also.

The teacher wears a headset through which she can hear each classroom. The transmitting microphone is built into this headset. According to the teacher, it is possible to distinguish between the classrooms on the basis of subtle differences in sound levels.

Because communication with the classroom is entirely auditory, the teacher has devised techniques for eliciting participation from each classroom. Each classroom has a designated "spokesperson", a position which rotates weekly. The spokesperson is the link between the class and the teacher, responsible for letting the teacher know of any questions or comments in the class. The teacher has the names of spokespersons for all classes posted while she broadcasts. After each example, or several times during the

explanation of new material, the teacher asks, "Any questions? Danny, Jenny?, and so on, naming each spokesperson. Any child with a question raises his hand, and is acknowleldged aloud by the class spokesperson. The interaction then becomes direct between questioning student and teacher.

Use of Aides

Classrooms in buildings other than the originating school are staffed by an aide. During 1981-82, two aides covered six of the seven elementary schools. The seventh school, which houses the broadcast station, has no regularly assigned aide, but the teacher is within a few feet of the classroom. Also, by an informal arrangement, an aide assigned to the learning center monitors the room periodically.

The aides help students with seatwork, distribute worksheets, assist with grading and record keeping, and are available to answer student's questions. Although they do not initiate the teaching of new concepts, they are prepared to followup and give students help as requested.

The two aides meet with the teacher approximately twice per week to plan lessons, review work to date, and discuss the progress of individual students, particularly students encountering difficulty. At these meetings strategies for dealing with disruptions are developed. For example, a field trip of one class is a major disruption. In an ordinary classroom, the teacher can pace instruction to adjust to a field trip. But since as many as three classrooms may receive a Telewriter broadcast simultaneously, absence of one class due to a field trip has a major effect on planning. Synchrony of instruction is crucial to successful program delivery. Often, extra individual sessions are scheduled for a class planning a field trip. The extra session may be during lunchtime or before school.

Teacher-Student Contact

Although the primary contact between teacher and student is through the auditory medium of broadcasting, the teacher does make an effort to achieve as much "in person" contact as possible. Makeup classes, held before or after a field trip, are taught in-person. Also, rather than broadcast to a single school (when other schools are on field trips, at assemblies, etc.), the teacher usually travels to the school to teach the class directly. Students know the teacher as a person, rather than as a voice.

Classroom Observation

Three sixth grade classes were observed. In one of the schools, a fifth grade program is offered (and was offered last year); the other two schools offer Telewriter to sixth graders only.

Because the absence of an "in person" teacher requires more than average attentiveness of students, an effort was made to quantify student attentiveness.

In each classroom, each student was observed for a period of five seconds. If, during the five second interval, student behavior was essentially "on task", a "+" was recorded. If not, a "-" was recorded. Each student was observed in turn. The entire sequence was repeated twice more at intervals of approximately ten minutes.

The number of "+" marks was expressed as a percent of students on task for each of the three samples of time. From these, an average percent of students on task was calculated for each of the three classes. These percents were 69%, 81% and 83%.

Although a much more comprehensive series of observations would be needed to draw inferences regarding student behavior in Telewriter, these fragmentary data do suggest the power of a teacher present only as a voice and a moving pen to command student attention.

DESIGN

The study focused on current sixth graders in the Telewriter program. Test score data were collected for 127 students, of whom 41 had been in Telewriter as fifth graders. According to District 181 staff, selection into Telewriter is based upon similar criteria at both the fifth and sixth grade levels. If student aptitudes at all District 181 elementary schools are similar, there should be no significant differences in mathematical aptitude between sixth grade Telewriter students who attend schools in which they could participate in Telewriter last year as fifth graders, and sixth graders attending schools where no Telewriter was offered fifth graders last year.

If this hypothesis of no significant differences among schools can be confirmed, then one may ask a series of questions about the current mathematical achievement of sixth graders who also had Telewriter as fifth graders, compared with sixth graders who did not. Similarly, attitudes and motivation data for the two groups may be examined for possible differences.

The design governing most data analysis is graphically depicted in Figure 1.

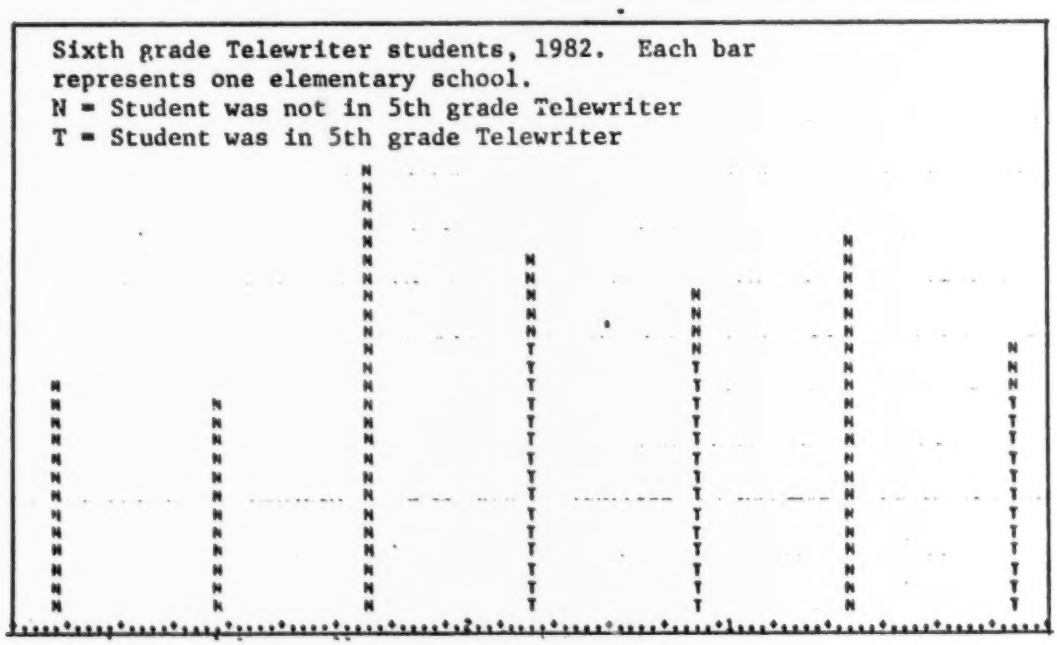

Sixth grade Telewriter students, 1982. Each bar represents one elementary school.
N = Student was not in 5th grade Telewriter
T = Student was in 5th grade Telewriter

Figure 1. Graphic representation of sixth grade students included in Telewriter evaluation study. Appproximately one third of 1981-82 Telewriter sixth graders were also Telewriter students as fifth graders.

Evaluation Questions

The major first question, necessarily, was "do significant differences exist between students in schools with the fifth grade Telewriter option, and students in schools without that option." Once that question was satisfactorily answered, an interactive approach to data analysis was adopted, with each question answered suggesting new questions, or new ways to rephrase a question. The following listing suggests the logic underlying the sequence of evaluation questions.

Mathematics Achievement

1. Are there significant differences between sixth graders who had Telewriter in fifth grade and those who did not (henceforth denoted TELEWR5 and NOTELE5) on three index variables composed of averages of three types of test scores: chapter tests, mathematical terms, and teacher-constructed tests?

2. Are there significant differences in achievement on in-class tests between TELEWR5 and NOTELE5 when prior mathematics achievement is controlled for statistically?

3. Of the eighteen test scores representing sixth grade achievement, which individual scores (or groups of scores) best discriminate TELEWR5 from NOTELEW5 students? (Several analyses were performed to examine this question.)

Student Attitude and Motivation

4. How did students respond to questionnaires regarding attitude towards Telewriter and general academic motivation?

5. Are there significant differences in attitude or motivation between TELEWR5 and NOTELEW5 students?

Questions 1 and 2 were examined using analysis of variance and co-variance; for question 3 step-wise discriminant analysis was used. Frequency tabulation and hand-coding of responses was performed for question 4; for question 5 analysis of variance again was employed.

ANALYSES AND RESULTS

For all uses of inferential statistics, the .05 probability level was selected as the criterion of significance.

The reader may notice that the number of cases varies slightly among analyses. This is because for each analysis, only student records with no missing data needed for that analysis were selected. This is less stringent than requiring complete data for each student record analyzed. This procedure does result in slight variations in N among the analyses. All analyses were performed using the BMDP statistical package at Northwestern University's Vogelback Computing Center.

Before any comparisons are made between students who were in Telewriter as fifth graders, and those who were not, it is necessary first to determine whether systematic school differences exist. If school differences exist (due to population differences in different neighborhoods, differential quality of teaching, etc.) then it will be difficult to separate "school effects" from "fifth grade Telewriter" effects.

To test for school differences, one-way analyses of variances (ANOVA) were performed, with school the independent (grouping) variable, and each of three California Achievement Test math subtest scores as the dependent variables. The California Tests were administered in fourth grade, before any students were introduced to Telewriter. As can be seen in Table 1*, there are no significant differences among schools on any of the three variables: GR4COMP (grade 4 math computation), GR4CNCP (grade 4 math concepts) or GR4TOT (grade 4 math total).

Mathematics Achievement Questions

1. Are there significant differences in achievement on in-class tests between sixth grade students who had Telewriter in fifth grade and those who did not?

To begin to answer this question, three composite variables were created. These consisted of the average (for each student) of all chapter tests (the composite variable is denoted NEWVAR1), the average of all teacher-constructed tests (NEWVAR2), and the average of the three mathematics terms tests (NEWVAR3).

* NOTE: To avoid extensive interruptions in the text, many of the Tables and Figures have been placed in sequential order in a special tabbed section immediately following the text.

A separate analysis of variance was performed for each dependent variable, NEWVAR1, NEWVAR2, and NEWVAR3. The independent variable was type of fifth grade math class, either Telewriter (TELEWR5) or regular grade 5 math (NOTELE5). These results are shown in Table 2; the two groups are significantly different only on the teacher-constructed composite variable, NEWVAR2 ($p<<.05$).

2. Are there significant differences between TELEWR5 and NOTELE5 students when prior mathematics achievement is controlled for statistically?

Although a previous analysis demonstrated no significant differences in fourth grade achievement among the seven schools, it is still possible that students selected for grade 5 Telewriter were, as a group, more able than students selected into the sixth grade Telewriter a year later. Each sixth grade class (in buildings with a fifth grade program) includes several children who did not have Telewriter in fifth grade. An analysis of covariance (ANCOVA) was performed to determine whether observed differences between the TELEWR5 and NOTELE5 groups (question 1 above) are more likely due to differential mathematics ability than to an extra year of Telewriter. A covariate, preferably a measure of some earlier aptitude or achievement, is used to "adjust" the means on the variables under analysis. Analysis of variance is computed using the statistically adjusted means.

For this analysis, the grade 4 California Achievement Test math total (GR4TOT) was chosen as a covariate, and six teacher-constructed test scores were analyzed separately. These were fractions (FRACT), operations with fractions (ASMDFR), whole numbers (WHOLNUM), a test on factorization (EFFING), int. fractions (INTFRAC), and operations with fractions and decimals (ASMDFD). Of these six variables, the ANCOVA yielded significant differences for two: FRACT and EFFING ($p<<.05$ for both). These results are displayed in Table 3.

The conclusion one may draw from this result is that sixth graders who studied math through the Telewriter program in both fifth and sixth grades performed significantly better on tests of fractions and prime factorization (the focus of the EFFING test) than did students who had Telewriter for sixth grade only. This use of a covariate helps to confirm that the difference is due to the fifth grade Telewriter program, not to innately better mathematics ability.

3. Of the eighteen test scores representing sixth grade achievement, which individual scores (or groups of scores) best discriminate TELEWR5 from NOTELE5 students?

This question was investigated using the statistical technique of forward step-wise discriminant analysis. This technique enables the user to begin with a set of variables and prespecified groups, and ask the computer to find the variable which best separates the groups. This done, additional variables may be added so long as their inclusion contributes to better group discrimination. The process stops when variable addition does not enhance discrimination of groups.

To begin, a separate discriminant analysis was performed for each of the three variable clusters examined earlier in question 1. These clusters are chapter tests, tests of mathematical terms, and teacher-constructed tests.

In the analysis using chapter tests, no variables were selected. This means that none of the seven chapter tests discriminated sufficiently between the TELEWR5 and NOTELE5 groups to meet the computer program's criterion.

In the analysis using the three tests of mathematical terms, TERMS3 was selected as the best discriminator. In the analysis with teacher-constructed tests, the variable FRACT (fractions) was chosen.

A final discriminant analysis was performed, using the best variables from all previous analyses, and also the Cooperative Primary test score from the grade 5 spring administration (SP5COOP). The variable list for this final analysis was: SP5COOP, FRACT, EFFING, TERMS3. Two variables were selected as discriminators in this analysis: FRACT and EFFING. The histogram depicting group separation on this combination of two variables is shown in Table 4. As a comparison, the histogram for a norm-referenced test from a previous analysis (SP5COOP) is shown in the lower half of Table 4. Note the relatively poor group discrimination effected by SP5COOP as compared with the combination FRACT and EFFING.

This constitutes further evidence of the enhanced achievement of students who were in fifth grade Telewriter on certain kinds of tests. The magnitude of group differences can be seen in the group means for the fraction and Effinger tests. On the fraction test, the TELEWR5 group mean is 73.1; the NOTELE5 mean is 54.5. On the Effinger test (of factorization) the TELEWR5 mean is 88.6; the NOTELE5 mean is 76.0. Table 4 displays these group means.

Student Attitude and Motivation

1. How did students respond to questionnaires regarding attitude towards Telewriter and general academic motivation?

Frequencies of responses to the Telewriter Attitude questionnaire and the Motivation questionnaire are presented in Tables 6 and 7, pages 13-16, which are blank facsimilies of the actual forms. In addition, student responses to the open-ended question on the attitude questionnaire were classified and summarized in Table 8, page 17.

Of the 118 students who completed the attitude questionnaire, slightly over half (65) wrote comments. A summary of student comment information is presented in Table 5, below.

TABLE 5

Student responses to open-ended question. Numbers represent frequencies of students in each category.

	TELEWR5	NOTELE5	Total
Comments generally positive	9	19	28
Comments generally negative	5	10	15
Comments balanced or neutral	4	18	22
No comment written	18	35	53
			118

Highlights of the Attitude questionnaire data are as follows:

a. A substantial majority of the students like Telewriter and are glad to be in the program. Many enthusiastic comments praise the course, the curriculum, and the challenge. (See Attitude questionnaire items 1, 2, 3, and 21, for example; also, the summarized comments.

b. Some students, perhaps between 15% and 25% of current sixth graders, have expressed negative feelings about the program. On the Attitude questionnaire, for example, (item 14), 82 students would choose to take the program again, 19 "don't know", and 17 answered "no". Similarly (item 20), 16 students felt the program was too difficult and 19 marked "don't know" to this item.

Such negative feelings are also documented in the open-ended comments. Eight students mentioned the "hard homework" and six said Telewriter is "too hard". (On the other hand, two wrote that Telewriter is too easy!)

c. About a fourth of the students believe the group size should be smaller (Attitude item 15). Several students elaborated in comments, saying that "some people are in the program who shouldn't be," and that "some people need too much attention and hold the others back."

Highlights of the Motivation questionnaire data are:

Most students appear confident of their academic ability (see, for example, items 8, 11, and 20), and tend to attribute their success - or lack of success - to their own efforts (items 6, 7).

2. Are there significant differences in attitude TELEWR5 and NOTELE5 students?

This question was addressed by scoring each questionnaire (summing all responses worded in the same positive direction), and performing an analysis of variance for each questionnaire. As in previous analyses, the groups consisted of students who were in Telewriter as fifth graders (TELEWR5) and those who were not (NOTELE5). There was no significant difference for either questionnaire.

The conclusion that follows is that previous participation in fifth grade Telewriter does not seem to contribute significantly, either positively or negatively, to the attitude or motivation of sixth grade Telewriter students.

TABLE 6

(ATTITUDE)

HINSDALE PUBLIC SCHOOLS

ELECTROWRITER QUESTIONAIRE

	YES	NO	DON'T KNOW	
1.	92	7	19	Do you like mathematics this year under the Electrowriter Program?
2.	72	25	20	Are you enjoying mathematics more this year than last?
3.	95	11	12	Has this Electrowriter Program made mathematics more interesting?
4.	100	5	15	Are you happy to be a member of the Electrowriter Program?
5.	87	4	25	Do you like the students in the group?
6.	90	9	19	Has this program made you want to work harder in mathematics?
7.	79	14	25	Are you satisfied with the book you are using?
8.	62	22	33	Do you feel you are prepared for tests after lessons on the Electrowriter machine?
9.	83	14	19	Do you feel that you get enough explanation from the Electrowriter aides?
10.	64	44	9	Do you receive help from other students in your group?
11.	95	10	13	Do you feel you have enough opportunity to ask questions?
12.	69	31	14	Do your parents help you with the lessonss?
13.	105	0	13	Are your parents happy that you are in the Electrowriter Program?
14.	82	17	19	If you had a choice, would you choose to take the Electrowriter course again?
15.	30	63	23	Should the size of the group in your school be smaller?
16.	8	92	18	Should the size of the group in your school be larger?
17.	62	41	13	Do you talk with other students from other schools who are also in the Electrowriter Program?
18.	84	15	18	Do you feel the program has made you a more independent worker?

TABLE 6 (Continued)

	YES	NO	DON'T KNOW	
19.	90	9	14	Do you feel the ElectrowriterProgram challenged you to work as hard as you could in math?
20.	16	76	19	Was the Electrowriter Program too difficult for you?
21.	99	4	9	Should the Electrowriter Program be continued for those fifth or sixth grade students that qualify?

Please add your own comments about the Electrowriter Program. It would be helpful to have your feelings and suggestions. What particular parts did you like best? What parts did you like least? When answering these questions think about the topics and how they were presented. Use as much of this sheet as you need.

TABLE 7

(MOTIVATION)
QUESTIONNAIRE

THIS IS NOT A TEST. Your teacher will not see these papers at all. Different children answer in different ways. The best answers are what you really think. We want to know what children your age think about certain ideas.

1. At home, once I start a new project I usually
   Finish it 5(41).4(53).3(20).2(0)..1(2).. Don't finish it

2. If I try something new, I like it to be mostly
   Hard 5(19).4(40).3(47).2(7)..1(4).. Easy

3. I am proud of my school work
   All the time 5(24).4(57).3(29).2(3)..1(3).. Never

4. At home I usually try new activities
   Often 5(35).4(29).3(28).2(19).1(6)..... Seldom

5. If my teacher needed someone to help with a job, she
   Might choose me 5(20).4(35).3(34).2(18).1(10). Probably would not choose me

6. I get punished when it is
   My fault 5(31).4(23).3(62).2(14).1(5).. Not my fault

7. When I do something well, it is because I
   Worked hard 5(80).4(30).3(2)..2(2)..1(3).. Was lucky

8. In reading, if I tried I would do
   Well 5(93).4(15).3(8)..2(0)..1(2).. Not well

9. If someone gets angry with me, I think of some way to make friends again
   Often 5(69).4(62).3(14).2(10).1(3).. Seldom

10. I wish I could change something about how I look, like my height, or my weight, or my hair, etc.
    Often 5(37).4(21).3(23).2(13).1(22). Seldom

11. In most school subjects, if I tried I would do
    Well 5(94).4(21).3(1)..2(1)..1(1).. Not well

12. My teacher is pleased with the way I behave
    All the time 5(14).4(67).3(25).2(8)..1(2).. Never

13. When I have a problem at home, I usually feel
    Very upset 5(39).4(35).3(29).2(11).1(3).. A little upset

14. When I try to do something I usually
    Plan carefully 5(32).4(57).3(22).2(6)..1(1).. Don't plan

15. In school my teacher expects
    Too much from me 5(17).4(34).3(60).2(3)..1(3).. Too little from me

16. Most decisions about me are made by
    My parents 5(8)..4(5)..3(69).2(19).1(35). Me

17. My parents are proud of me
    Often 5(74).4(32).3(7)..2(2)..1(2).. Seldom

18. If something goes wrong, I usually
    Change it 5(29).4(38).3(35).2(8)..1(8).. Live with it

19. When the teacher starts a brand new subject, I usually feel
    Excited 5(30).4(38).3(37).2(8)..1(5).. Frightened

20. In math, if I tried I would do
    Well 5(77).4(30).3(4)..2(4)..1(3).. Not well

21. At home my parents usually expect
    Too much from me 5(21).4(35).3(50).2(6)..1(4).. Too little from me

TABLE 7 (Continued)

22.	When I have a hard problem I usually Keep trying to solve it	5(40).4(47).3(23).2(2)..1(5)..	Give up
23.	With outdoor sports and games, I usually play Well	5(56).4(21).3(21).2(13).1(3)..	Not well

Grade?_____

Girl? 58

Boy? 56

TABLE 8

Summarized positive and negative responses of Telewriter students to an open-ended question on Attitude questionnaire. Numbers in parenthesis indicate number of students recording that view. A total of sixty-seven students wrote comments.

Positive Comments

(10) I like the challenge.
(10) Telewriter is great, should be continued.
(9) I like (named a specific topic. Examples: percent, fractions, "n" problems, chapter tests, math puzzles, decimals and mixed numbers.
(6) I like Telewriter.
(3) I work harder and learn a lot.

Individual students also made the following comments:

It makes my parents proud of me.
My best and most challenging math classes ever.
I like the teachers.
The program does sharpen the mind.
It prepares you for Junior High homework.

Negative Comments

(8) Too much hard homework.
(7) I don't like (named a specific topic. Examples: worksheets, converting decimals to percent, chapter tests, terms, fractions.
(6) Telewriter is too hard.
(6) Should limit group size, have fewer people in Telewriter.
(4) Need more time (for tests, for some chapters, to ask questions.
(3) Sometimes need more help from teacher/aides.
(2) The book is not very good.
(2) Telewriter is too easy.

Individual students also made the following comments:

I would like to have a teacher in the room.
When the teacher calls on me, I get butterflies in my stomach.
We should have a chance to do some homework in class.
It's boring when children (in other schools) ask questions you can't hear.

SUMMARY AND RECOMMENDATIONS

Summary

This report has described in detail the results of an evaluation of the Telewriter program in Hinsdale District 181. The evaluation included examination of achievement data, attitude and motivation data, and data obtained from a day-long site visit observation of the program.

Major findings of the project are as follows:

1. Sixth grade students, who were in the Telewriter program in both fifth and sixth grades, tend to perform better on certain kinds of tests than students who were in the program only during sixth grade. This particularly noticeable on tests of fractions and factorization.

2. There is no significant difference in attitude or motivation, as measured by instruments administered by Telewriter staff, between sixth graders who were in Telewriter as fifth graders and those who were not.

3. Most students like Telewriter and hope that the program will continue. A substantial percentage of students, however, perhaps as large as 20%, expressed negative feelings. Many of these students would probably not choose Telewriter again.

4. About 25% of the students believe group size should be smaller. Comments written by some students indicate a belief that too many students, some underprepared, are admitted to Telewriter.

Recommendations

District 181 Telewriter staff and administrators may wish to consider one or more of the following recommendations.

1. Continue to offer Telewriter to both fifth and sixth graders. Ample achievement and attitude data support this recommendation.

2. Modify the fifth grade selection criteria to become more stringent. Attitude data suggests that some students currently in the program are unhappy, and some students feel the class is held back by the presence of underprepared students.

3. Consider offering Telewriter to those fifth graders in all elementary schools who are most likely to benefit from it.

4. Implement the more restrictive fifth grade selection criteria only in the schools not now served by fifth grade Telewriter. Compare student attitude of students selected by restrictive criteria with attitude of students selected by current criteria.

Telewriter is an unusual approach to mathematics instruction in the elementary school. Implementation of such a program requires a high order of administrative support, and gifted teaching. Telewriter has enjoyed both.

District 181's commitment to the evaluation described in this report also has demonstrated the district's interest in continuing to examine and improve its programs. The future of programs so thoughtfully reviewed is indeed bright.

REFERENCE

"A Multidimensional Motivation Instrument", M. Ururoglu, D. Schiller and H.J. Walberg. Psychology in the Schools, (1981, Volume 18), pp. 279-285.

TABLES

TABLE 1

Analysis of variance tables for three standardized achievement tests administered before students were in Telewriter. Tests are GR4COMP (grade 4 math computation), GR4CNCP (grade 4 math concepts) and GR4TOT (grade 4 math total). Groups are the seven District 181 elementary schools. There are no significant differences among schools on any of the three variables.

Group means are displayed below the ANOVA tables.

ANALYSIS OF VARIANCE TABLE : GR4COMP

SOURCE OF VARIANCE	D.F.	SUM OF SQ.	MEAN SQ.	F-VALUE	PROB(TAIL)
EQUALITY OF CELL MEANS	6	2412.2568	402.0428	1.7000	.1272
ERROR	115	27196.6367	236.4925		

ANALYSIS OF VARIANCE TABLE : GR4CNCP

SOURCE OF VARIANCE	D.F.	SUM OF SQ.	MEAN SQ.	F-VALUE	PROB(TAIL)
EQUALITY OF CELL MEANS	6	383.8915	63.9819	.7725	.5931
ERROR	115	9524.4446	82.8213		

ANALYSIS OF VARIANCE TABLE : GR4TOT

SOURCE OF VARIANCE	D.F.	SUM OF SQ.	MEAN SQ.	F-VALUE	PROB(TAIL)
EQUALITY OF CELL MEANS	6	578.1297	96.3549	1.4084	.2173
ERROR	115	7867.7064	68.4148		

ESTIMATES OF MEANS (N)

		ELM (15) 1	LAKE (22) 2	MADISON (16) 3	MONROE (20) 4	OAK (27) 5	PROSPCT (12) 6	WALKER (13) 7	TOTAL 8
GR4CNCP	7	98.3333	98.8476	98.5788	94.1588	92.8888	95.4545	92.2588	91.9262
GR4COMP	8	92.2667	86.3333	80.2185	93.8888	83.8333	98.3636	92.8888	87.3852
GR4TOT	9	92.2388	98.6667	98.2185	95.6588	91.4167	96.2727	93.9167	92.5738

TABLE 2

Analysis of variance tables for composite variables NEWVAR1, NEWVAR2, and NEWVAR3, where groups are students who were in fifth grade Telewriter (TELEWR5) and students who were not (NOTELE5). Groups differ significantly only on NEWVAR2, a composite of teacher-constructed tests.

Group means are displayed below the ANOVA tables.

NEWVAR1

ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIANCE	D.F.	SUM OF SQ.	MEAN SQ.	F-VALUE	PROB(TAIL)
EQUALITY OF CELL MEANS	1	13.9589	13.9589	.4516	.5031
ERROR	103	3183.4942	30.9077		

NEWVAR2

ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIANCE	D.F.	SUM OF SQ.	MEAN SQ.	F-VALUE	PROB(TAIL)
EQUALITY OF CELL MEANS	1	954.7206	954.7206	9.1720	.0031 *
ERROR	103	10721.3187	104.0905		

NEWVAR3

ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIANCE	D.F.	SUM OF SQ.	MEAN SQ.	F-VALUE	PROB(TAIL)
EQUALITY OF CELL MEANS	1	269.2177	269.2177	2.5237	.1152
ERROR	103	10987.6669	106.6764		

*p < .05

ESTIMATES OF MEANS

		TELEWR5 1	NOTELE5 2	TOTAL 3
NEWVAR1	30	90.1555	89.3763	89.6288
NEWVAR2	31	82.7610	76.3169	78.4036
NEWVAR3	32	82.7647	79.3427	80.4508

TABLE 3

Analysis of covariance (ANCOVA) tables for six teacher-constructed tests: fractions (FRACT), operations with fractions (ASMDFR), whole numbers (WHOLNUM), factorization (EFFING), int. fractions (INTFRAC), and operations with fractions and decimals (ASMDFD); grouped by students who had fifth grade Telewriter (TELEWR5) and students who did not (NOTELE5). Covariate is fourth grade California Achievement Test Total Math score (GR4TOT). Significant differences are noted for FRACT and EFFING scores.

Group means are displayed below.

FRACT	SOURCE OF VARIANCE	D.F.	SUM OF SQ.	MEAN SQ.	F-VALUE	PROB(TAIL)
	EQUALITY OF ADJ. MEANS	1	6994.9098	6994.9098	12.4529	.0006 *
ASMDFR	SOURCE OF VARIANCE	D.F.	SUM OF SQ.	MEAN SQ.	F-VALUE	PROB(TAIL)
	EQUALITY OF ADJ. MEANS	1	600.6337	600.6337	2.6661	.1096
WHOLNUM	SOURCE OF VARIANCE	D.F.	SUM OF SQ.	MEAN SQ.	F-VALUE	PROB(TAIL)
	EQUALITY OF ADJ. MEANS	1	71.9160	71.9160	.5206	.4327
EFFING	SOURCE OF VARIANCE	D.F.	SUM OF SQ.	MEAN SQ.	F-VALUE	PROB(TAIL)
	EQUALITY OF ADJ. MEANS	1	2178.2193	2178.2193	8.1234	.0053 *
ASMFD	SOURCE OF VARIANCE	D.F.	SUM OF SQ.	MEAN SQ.	F-VALUE	PROB(TAIL)
	EQUALITY OF ADJ. MEANS	1	211.1773	211.1773	2.2753	.1345
INTFRAC	SOURCE OF VARIANCE	D.F.	SUM OF SQ.	MEAN SQ.	F-VALUE	PROB(TAIL)
	EQUALITY OF ADJ. MEANS	1	33.8062	33.8062	.1450	.7042

* p .05

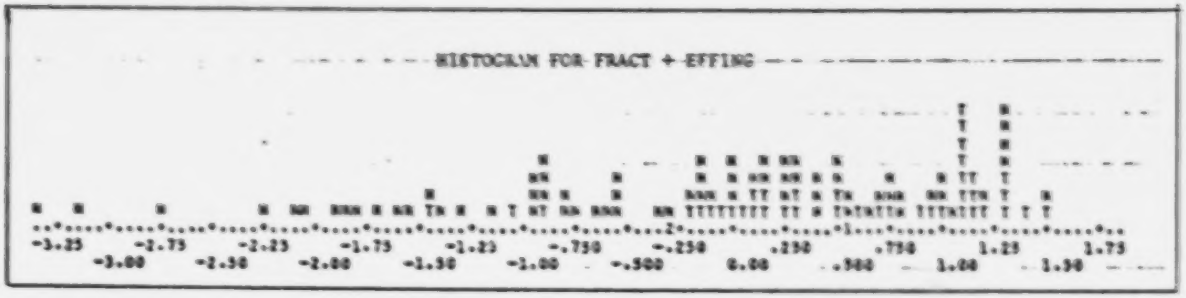
GROUP MEANS		(n=35) TELEWR5 1	(n=70) NOTELE5 2	TOTAL 3
GR4TOT	9	94.1429	91.7429	92.5429
FLoCOJP	11	27.2200	25.4857	26.0867
FRACT	12	72.2286	51.4286	58.3619
ASMDFR	15	81.8286	75.0714	77.3238
WHOLNUM	16	84.9143	82.0429	83.0000
EFFING	24	87.6857	76.0429	79.9238
INTFRAC	27	84.5429	80.1857	81.6381
ASMDFD	29	80.3714	78.1000	78.8571

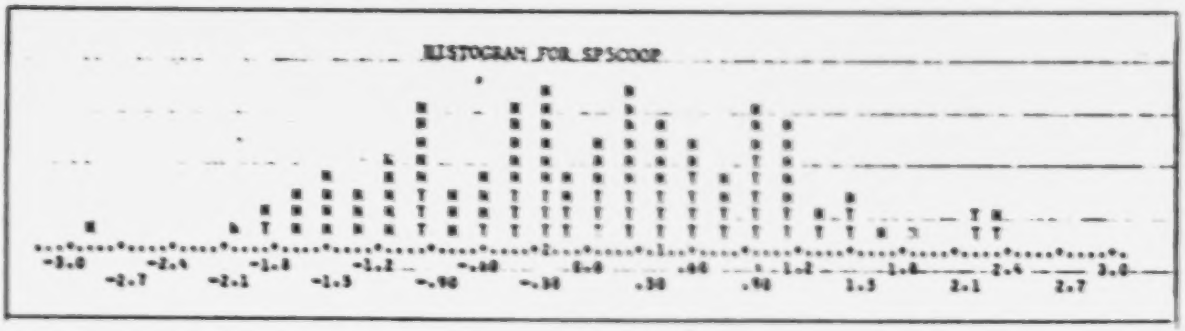
TABLE 4

Histogram of differences between students who were in Telewriter as fifth graders (denoted by a T) and those who were not (N). Histogram obtained by a forward stepwise discriminant analys in which the teacher-constructed tests on fractions and factorization were selected as the best discriminators between the two groups.

Below, for comparison, is a histogram of scores of the two groups on a norm-referenced test given at the end of fifth grade to all students (Cooperative Primary Arithmetic Test). Note that the Cooperative Primary TEst does not discriminate well between the two groups.

Group means are displayed below.





MEANS

GROUP → VARIABLE	TELEWRS	NOTELES	ALL GPS.
10 SPSCOOP	28.85000	25.53521	26.72973
12 FRACT	73.17500	54.49296	61.22523
20 TERMS3	90.12500	83.42254	85.83784
24 EFFING	88.62500	75.98592	80.54054
COUNTS	40.	71.	111.

APPENDIX

TEST SCORE DATA

Compiled for Telewriter Study

The following data were compiled by Mrs. Kathy Effinger and recorded on coding forms developed for the Telewriter evaluation. A photo-reduced sample copy of the coding form may be found on the next page. These data were obtained for all current sixth graders (N = 127).

Demographic data
- ID number (3 digit, assigned by IER)
- sex
- 5th grade math teacher (used to determine which students had Telewriter as 5th graders)
- school
- month and year of birth

Standardized Test Scores

California Achievement Test, three subtests, administered in fourth grade:
- Math Concepts
- Math Computation
- Total Math

Cooperative Primary Tests
- Arithmetic, administered spring of grade 5
- Arithmetic, administered fall of grade 6

In-class Test Scores

Chapter Tests
- Chapter 1
- Chapter 2
- Chapter 3
- Chapter 4
- Chapter 6
- Chapter 8
- Chapter 9

Mathematical Terms
- Terms 1
- Terms 2
- Terms 3

Teacher-constructed Tests
- Fractions Survey
- ASMD fractions
- Whole numbers
- Followup to Chapter 4
- Followup 2 to Chapter 4
- Effinger test (on factorization)
- Int. Fractions
- ASMD fractions/decimals

ILLIAC II/III DATA FORM

ID number	STUDENT NAMES	SEX	SCHOOL	Month & Yr. of birth	4th grade CAT scores: Math concepts	Math comp-utation	5th grade CAT scores: Total Math	Spring 9-5	Fall Gr. 6	Coop Arith Scores: Fraction Sense	Chpt 1	Tuning	IN-CLASS TEST SCORES: ASHO Fractions	Whole Nos	Chpt 2	Tuning	Chpt 3	Tuning	Chpt 4	-4	MOTIVATION ATTITUDE -4	Chpt 5	Chpt 6	Chpt 7	Tot. Fraction	Chpt 9	ASHO
0250	[redacted]	1	1	2	01	21	10	93	91	85	90	28	90	95	90	56	77	84	52	70	66	85	75			15	90	85	95	79	75		60
0251	[redacted]	1	1	2	05	21	10	91	98	97	82	24	90	95	84	94	96	95	72	99	91	95	90			99	90	99	95	89	70		
0252	[redacted]	1	NI	2	02	21	10	NI	NA	NA	90	88	—	—	—	—	—	—	—	—	—	→				110	→	→	90	78	75		99